

REMARKS/ARGUMENTS

Favorable reconsideration of this application as currently amended and in view of the following remarks is respectfully requested.

Claims 1-8, 13-21, 23, 24, 26-29, and 39 are presently active in this case. Claims 1, 13, 14, 19-21, 23, 24, 26, 28, and 29 have been amended and claims 22 and 25 have cancelled by the present amendment.

In the outstanding office action, Figures 1 and 2 were objected to for not being designated as --Prior Art--; Claim 15 was rejected under 35 USC 112, first paragraph, for failing to comply with the written description requirement; Claims 13, 14, 16-20, 23, and 24-29 were rejected under 35 USC 112, second paragraph, as being indefinite; Claims 1-5, 8, 13-15, 19-28, 28, 29, and 39 were rejected under 35 USC 102(e) as being anticipated by Carey et al. (6,686,066); Claims 6 and 7 were rejected under 35 USC 103(a) as being unpatentable over Carey et al. in view of Moodera et al. (5,835,314); and Claims 16-18 and 25-27 were rejected under 35 USC 103(a) as being unpatentable over Carey et al. in view of "AAPA" (Applicant Admitted Prior Art).

In response to the objection to the drawings, Applicants have submitted herewith replacement drawings including Figures 1 and 2 designated as "Prior Art." No further objection to the drawings is therefore anticipated.

In response to the rejection of Claim 15 under 35 U.S.C. § 112, first paragraph, for failing the written description requirement, Applicants have amended the specification to include disclosure incorporated by reference to U.S. Patent No. 6,560,077. In particular, Applicants have amended the specification to clarify the definition of "exchange length". No new matter has been added. In view of the amendment to the specification, no further rejection to Claim 15 under 35 U.S.C. § 112, first paragraph, is anticipated.

In response to the rejection of Claims 13, 14, 19, 20, 23, 24, 28, and 29 under 35 U.S.C. § 112, second paragraph, Applicants have amended those claims to clarify that the width of the confined current paths is greater than  $t^{3/2}$  where  $t$  is the thickness measured in nanometers of the ferromagnetic layers. In view of these amendments, no further rejection of Claims 13, 14, 19, 20, 23, 24, 28 and 29 is anticipated under 35 U.S.C. § 112, second paragraph.

In response to the rejection of Claims 16-18 and 25-27 under 35 U.S.C. § 112, second paragraph, Applicants respectfully traverse. Applicants submit that the limitations recited in those claims are disclosed in the specification. With regard to Claims 16 and 25, the features recited therein are disclosed on page 17, lines 1-13 and page 18, lines 3-9. With regard to Claims 17, 18, 26, and 27, the features recited therein are disclosed in Applicants' specification at page 17, lines 13-18. Applicants believe that the above remarks are fully responsive to the rejection of Claims 16-18 and 25-27. However, if further issues remain, the Examiner is invited to contact the undersigned for further discussion.

Briefly recapitulating, the present invention (Claim 1) is directed to a CPP spin-valve element including a free layer structure; a pinned layer structure; a thin non-magnetic spacer layer structure; and at least two current-confining layer structures. Each of the at least two current-confining layer structures is located on a different side of the thin non-magnetic spacer layer. As a consequence of this configuration, the total resistance, the magnetoresistance, and the giant magnetoresistive effect are substantially enhanced relative to prior CPP spin valve element configurations. See page 9, lines 8-22 of the specification.

The present invention (Claim 19) is also directed to a CPP spin valve element including a free layer structure; a pinned layer structure; and a thin non-magnetic current confining layer structure. The width of the confined current paths of the current confining

layer structure is greater than  $t^{3/2}$  where  $t$  is the thickness of at least one of the free layer structure and the pinned layer measured in a nanometers.

Likewise, Claim 28 defines a configuration including at least one current confining layer structure where the width of at least one of the confined current paths is the same width defined by Claim 19.

Lastly, Claim 21 is directed to a CPP spin valve element including a free layer structure; a pinned layer structure; a first thin non-magnetic current confining layer structure; and a second current confining layer structure placed across at least one of the free layer and the pinned layer. The conducting parts of the CC layers are located in a cascade manner and at least an inner edge to edge distance of a projection of the conducting parts of the CC layers forming at least one of the current paths through the free layer structure or the pinned layers onto the layer plane is made greater than a thickness of at least one of the free layer structure and the pinned layer. This configuration facilitates obtaining a high magnetoresistance.

Regarding Claim 1, the outstanding Official Action asserts that Carry et al. disclose a thin non-magnetic spacer layer structure 306. Figure 3 of Carry et al. illustrates that the layer 306 is sandwiched between ferromagnetic layers 308 and 304. As illustrated in Figure 3, the current confining paths are provided through layer 306. However, Claim 1 defines that each of the two CC-layer structures is located on a different side of the thin non-magnetic spacer layer. Consequently, Carry et al. are not believed to anticipate Claim 1 as amended and the 35 U.S.C. § 102(e) rejection should be withdrawn.

Regarding Claims 19 and 28, Applicants respectfully point out that column 5, lines 22-24 of Carry et al., relied upon in the outstanding Office Action to teach the width of the current confining layer structure, teaches that the content of the conductor grains 210 in the spacer layer typically ranges from 1 to 50% volume of the spacer layer 204. Nowhere does Carry et al. teach or suggest the width of the confined current paths. Regarding the thickness

of either the free or pinned layers, the Official Action relies upon the teaching in Carry et al. at column 5, lines 50-54. However, that passage teaches that the thickness of the spacer layer is 5 nm, the length of the spacer layer is 50 nm, and the sides of the spacer layer is about 50 nm. However, Carry et al. is silent with regard to the thickness of either the pinned or free layer structures. Consequently, Carry et al. are not believed to anticipate or render obvious the subject matter defined by Claims 19 and 28.

Regarding Claim 21 as amended, Applicants traverse the assertion that Carry et al. in view of "Applicants' admitted prior art" disclose or suggest the feature recited in Applicants' original Claim 25. Applicants point out that the cascade feature is not taught or suggested by any of the prior art discussed in its specification. As discussed above with regard to the 35 U.S.C. § 112, first paragraph, rejection, the cascade feature facilitates obtaining a high magnetoresistance not disclose or suggested by the applied art. Consequently, Carry et al. are not believed to anticipate or render obvious the subject matter defined by Claim 21 when considered alone or in combination with the art disclosed in Applicants' specification and/or the applied art.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. An early and favorable action is therefore requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.



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J. Derek Mason  
Attorney of Record  
Registration No. 35,270

W. Todd Baker  
Registration No. 45,265

Customer Number

**22850**

Tel: (703) 413-3000  
Fax: (703) 413 -2220  
(OSMMN 06/04)

IN THE DRAWINGS

The attached sheets of drawings includes changes to Figs. 1 and 2. These sheets, which includes Fig. 1 and 2, replaces the original sheets including Fig. 1 and 2.

Attachment: Replacement Sheets